A compact, low power pulsed optical communication system for spacecraft

- PI: Dr. John W. Conklin, University of Florida
- Paul Serra, PhD candidate, University of Florida
- Two additional doctoral students

Research Objectives

- Develop a 5 W, 2 kg, up to 100 Mbps optical communication system from TRL 1 to TRL 3.
- FPGA-based Differential Pulse Position Modulator
  - Sub-nanosecond slot width
  - Long symbol length → low average power, high peak power
- Low power Master Oscillator Power Fiber Amplifier laser system
  - ~ 200 psec, 1550 nm > kW peak power
- Compact structure, thermal management

Approach

- System level design:
  - Required timing accuracy, laser power, slot width
- Chip Scale Atomic Clock driven Delay Locked Loop to produce precise delays
- Optimization of peak optical power vs. average pump power for MOPFA system
- Laboratory testing of prototype FPGA modulator, MOPFA laser system, and compact instrument structure
  - Delay time accuracy, average versus peak power, and beam quality

Potential Impact

- Versatile, low power optical communications
  - Deep space small satellites
  - Missions with highly constrained SWaP
- Low mass, volume, power instrument enables demonstration on nanosatellite
  - 3-6U CubeSat within 5-8 years
- Heavy student involvement; prepares next generation of space technologists